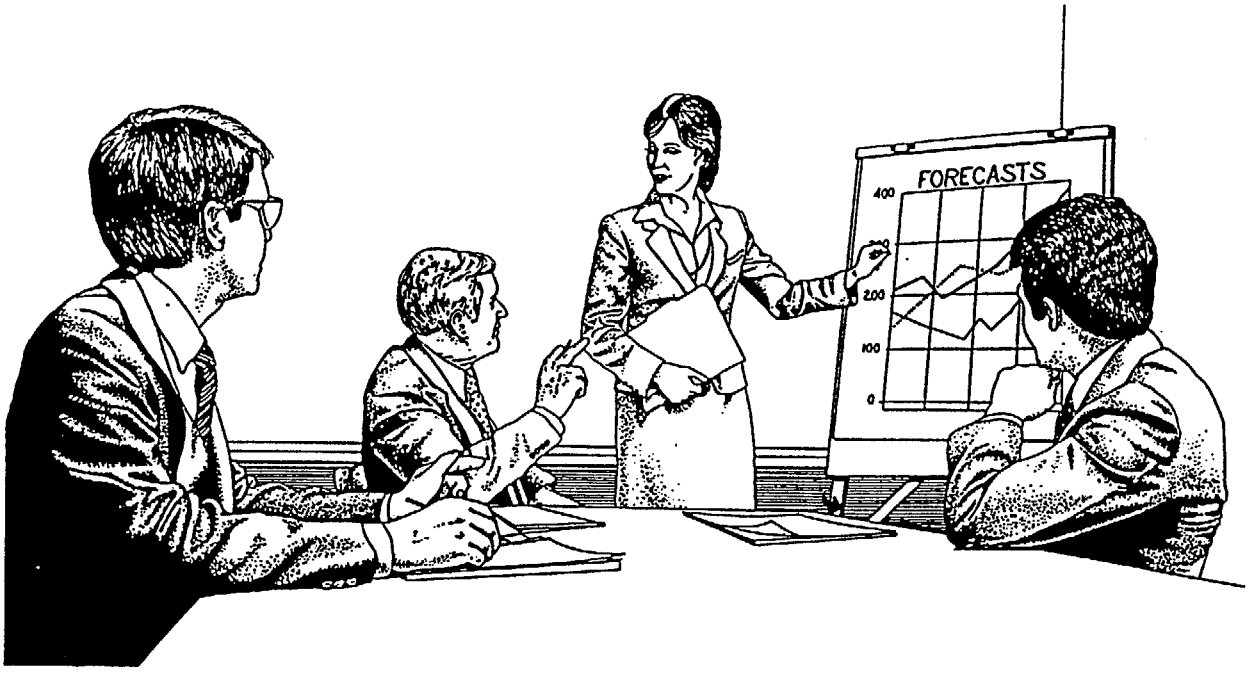
Chapter Two
AVIATION DEMAND FORECASTS

H.A. Clark Memorial Field



Chapter Two
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H.A. Clark Memorial Field

To serve as the basis for the planning of aviation facilities at H.A Clark Memorial Field, aviation forecasting efforts were undertaken. Forecasts serve as a prediction of future aviation demand for the airport over the 20-year planning period, and allow the airport sponsor to anticipate changes in aviation needs.

While it is difficult to predict the exact level of future aviation activity on a year-to-year basis over an extended period of time, a growth curve can be established to describe the overall long-term potential of the airport. Even though a single line is often used to express the anticipated growth, it is important to remember that actual growth may fluctuate above and below this line. Aviation forecasts predict the magnitude of change over time and should serve only as guidelines for facility and financial planning.

The results of forecasting efforts are applied to several phases of the Master Plan. Initially, these results are used to analyze the airport's capability and capacity to meet existing and future aviation demand. Later in the planning process, the forecasts are used to evaluate the financial feasibility of proposed development actions and to project the airport's revenue and expenses. Finally, the forecasts are used to model aviation noise conditions around the airport.

Aviation activity is affected by many external influences, as well as by the facilities and services available. Since the first powered flight, aviation has become the most dynamic form of transportation in the world. Because it is dynamic, changes and major technological breakthroughs have resulted in erratic growth patterns. More recently, regulatory and economic actions have created very significant impacts upon activity patterns at many airports. The following sections describe the available data for historical activity for H.A. Clark

Memorial Field, Coconino County and the State of Arizona, and discuss aviation trends at the national level that could influence future growth at the airport.

FORECASTING PROCEDURES

The systematic development of aviation forecasts generally involves both analytical and judgmental processes. A series of mathematical relationships are tested to establish statistical and logical rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience and detailed knowledge of the situation, is important in the final subjective determination of the preferred forecast.

The analysis begins with the assessment of historical trends as data is collected and sorted on a variety of aviation indicators at the local, regional, and national level. Data on aviation related factors such as aircraft operations, based and registered aircraft, and fuel sales were obtained for the analyses. Similarly, socioeconomic factors such as population, income, and employment are also analyzed for the effect that they have had on aviation activity. The identification and comparison of the relationships between these various indicators provides the initial step in the development of realistic forecasts of aviation demand.

As part of the analytical process, trend lines based upon historical relationships are extended into the future. Trend lines developed through the use of a variety of techniques are called projections.

FORECAST METHODOLOGY

The most reliable approach to estimating future aviation demand is to use a number of analytical models, and then to compare the results. The most common techniques used include the following: correlation analysis, regression analysis, time-series extrapolation, and market-share analysis.

Correlation analysis examines the direct relationship between two or more sets of historical data. Used primarily as a statistical test on a multiplicity of variables, this analysis will detect significant correlations between sets of data. These sets can then be evaluated further using regression analysis.

In **regression analysis**, projections of an aviation demand element (representing the dependent variables) are prepared based upon their relationship to one or more aviation indicators, representing independent variables. Aircraft operations and based aircraft are examples of dependent variables, while population, per capita income, gross national product, and other socioeconomic factors are examples of independent variables. Linear, curvilinear, and multiple regression analyses are tested in an attempt to define a relationship from which future activity can be projected.

Time-series, least squares extrapolation is probably the simplest, most widely used method of forecasting. This technique involves the fit of classical growth curves to future years. In utilizing this technique, an assumption is made that the same factors that have affected aviation demand in the

past will continue to affect aviation demand in the future. While this can be a rather broad assumption, it can often provide a reliable benchmark for comparing the results of other analyses.

The **market-share** technique involves a review of the aviation activity at H.A. Clark Memorial Field in proportion to a larger aviation market. The local share-of-the-market factor is multiplied by forecasts of the larger market for a projection. This *top-down* approach can prove useful as a check on the validity of projections based on other techniques.

These forecasting techniques are used to develop projections for several key aviation activity indicators, such as based aircraft, aircraft mix, aircraft operations and peaking characteristics.

In the selection of a preferred forecast, several other intangible factors should be weighed.

- Character of the surrounding community.
- Potential changes in the economic environs.
- Established plans of local developers/ users.
- Impact of new facilities or improved services.
- Policies of the airport owner and operator.
- Airport's changing role within the aviation system.

While one cannot assume a high level of confidence in forecasts that extend beyond five years, more than five years of forecasts is often needed to complete a facilities development program, and at least twenty years is necessary to adequately amortize most capital improvements. For this reason, the planning results should be flexible in order to respond to unanticipated deviations from the forecasts.

TRENDS AT THE NATIONAL LEVEL

Each year, the FAA publishes a national forecast of aviation activity. Included in these projections are categories for air carriers, air taxi/commuters, general aviation, and military activity. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA, and to provide information that can be used by state and local authorities, the aviation industry, and the general public.

The current edition of the *FAA Aviation Forecasts, Fiscal Years 1993-2004*, was used as a basis for the development of a series of forecasts for H.A. Clark Memorial Field. A synopsis of the FAA report of both existing and anticipated future conditions in the aviation sector is presented in the paragraphs that follow.

The general aviation industry is an important contributor to the nation's economy. General Aviation (GA) includes the production and sale of aircraft, avionics and other equipment, along with the provision of support services such as flight schools, fixed base operators, finance and insurance. The single engine piston aircraft market is the base on which GA activity builds. New pilots are trained in single engine piston aircraft and work their way up through retractable landing gear, multi-engine aircraft to turbine aircraft. When the single engine piston market declines, it signals the slowing of expansion in the GA fleet and, consequently, a slowing in the rate of growth of activity at airports.

The total active general aviation fleet decreased from 204,700 active general

aviation aircraft in 1987 to 197,400 in 1991, but increased in 1992 to 198,400. Single engine piston aircraft increased from 153,500 to 154,000 during the 1991-92 period. The multi-engine and turbojet aircraft each increased slightly from 21,100 and 4,100, respectively, in 1991 to 21,200 and 4,400, respectively, in 1992. Turboprop and rotary (helicopters) aircraft each declined during that same period; turboprop from 5,300 to 4,900 and rotary aircraft from 6,900 to 6,300.

Single engine aircraft still dominate the statistics comprising 83.5 percent of the fleet but less than the 90.6 percent share of the fleet they held in 1975. Multi-engine aircraft constitute 11.5 percent, turboprop aircraft 2.6 percent, and turbojet aircraft comprise 2.4 percent of the fixed wing aircraft fleet. Piston aircraft shipments declined by 14.2 percent between 1991 and 1992. Turboprop shipments declined by 21.2 percent and turbojets declined by 8.1 percent during the same period. In total, the general aviation fleet has been relatively stable in size since 1980.

The cost factors affecting general aviation indicate that a dramatic turnaround in general aviation statistics is not likely in the near future. As the cost of aircraft has continued an upward climb since 1975, total aircraft shipments (**Exhibit 2A**) have declined (from 1,021 in 1978 to 872 in 1992). Operating and maintenance costs, which appeared to level off in the early 1980's (even declining slightly during the period 1985-1989), have increased over the last few years, affecting all classes of aircraft (single engine, multi-engine, turbojet, etc.). The number of flying hours decreased in 1992 to 29.9 million hours from the 1991 level of 30.5 million hours. This decrease affected all aircraft types: single engine aircraft hours decreased 1.44 percent, multi-engine hours decreased 5.41 percent, turboprop hours decreased 11.76 percent and turbojet hours decreased 7.96 percent.

The FAA has found that general aviation forecasts do not follow "normal" trends or traditional economic variables. On the whole, general aviation did not respond to the economic recovery between 1982-1989, one of the most robust since the postwar period. Several factors have played a major role in this disparity, such as higher aircraft prices, operating costs, interest rates and product liability costs. Airline deregulation has also affected general aviation; increased service and better connections have reduced the demand for private flights to destinations served by commercial airlines. The recent rise in airline fares and increased congestion at airports, however, may make the general aviation alternative more attractive in the future. There is also the school of thought that the overvalued dollar of the 1980's severely depressed the export market. Increased competition from other travel modes and methods of communication, as well as a decrease in leisure time may also play a significant role in the lack of growth in the aviation industry.

Summarizing the assumptions under which the FAA forecasts were developed, the active general aviation fleet is expected to grow a modest 0.57 percent annually over the FAA's 12-year forecasting period. The single engine piston fleet would be expected to grow moderately over the same period, increasing from 154,000 in 1992 to 159,300 in 2004. A slight increase in the number of multi-engine aircraft is also predicted, from 21,200 in 1992 to 22,100 in 2004. Reflecting the increasing sophistication of general aviation aircraft, turbine powered aircraft are anticipated to increase from 9,300 in 1992 to 13,000 in 2004, an average annual growth rate of

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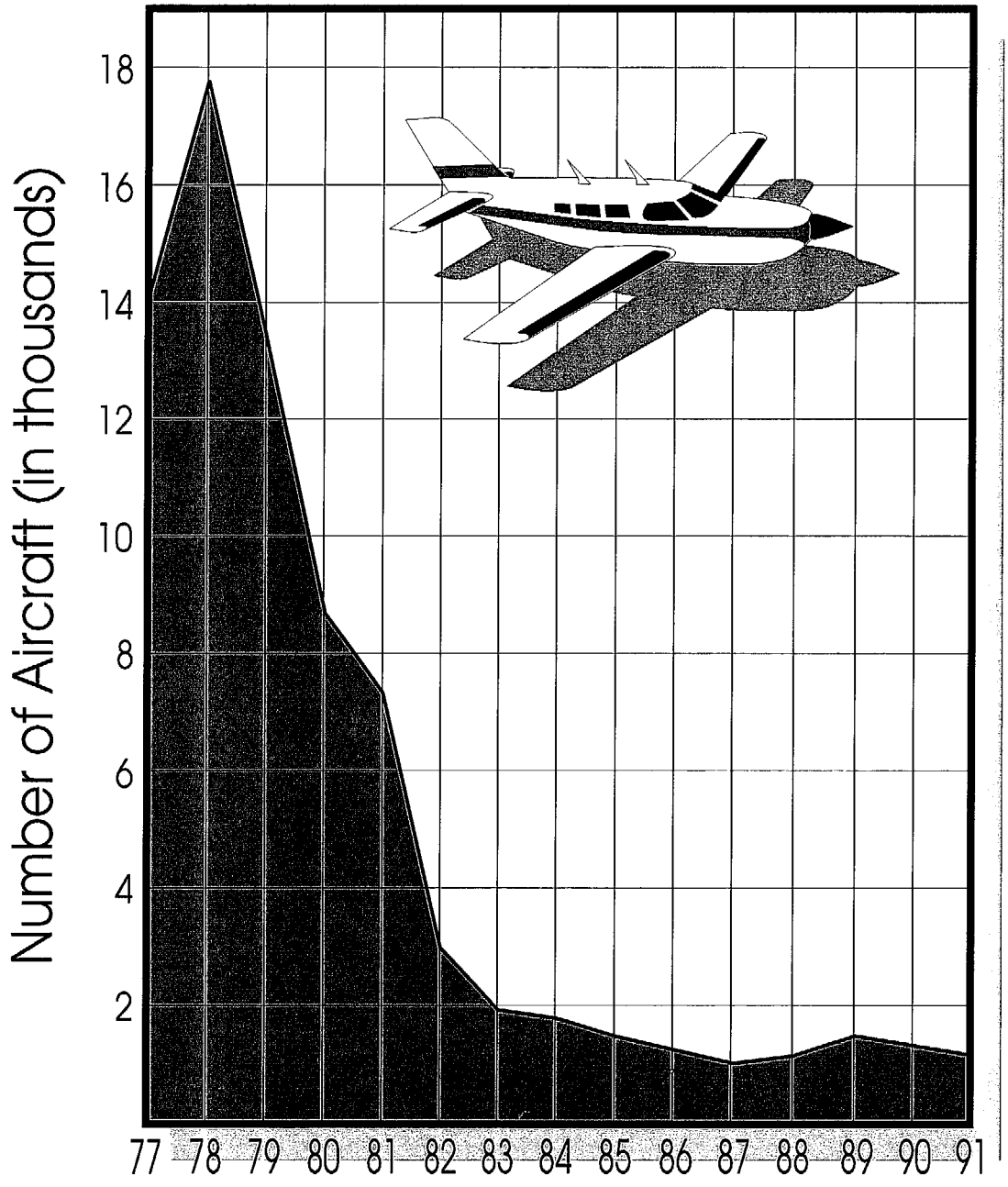

H.A. Clark Memorial Field
AIRPORT MASTER PLAN
Williams, Arizona

Exhibit 2A
GENERAL AVIATION AIRCRAFT
SHIPMENTS (1977-1991)

2.83 percent. The turbine rotary aircraft are expected to grow at an average rate of 4.97 percent annually. All of these forecasts (with the exception of turbine rotorcraft) represent a decline in the total numbers from the previous FAA forecasting effort in 1992.

The pilot population is also anticipated to increase with most of the growth coming in the number of airline pilots needed to meet the growing demand for scheduled air carrier service (1.2 percent annually) while the private pilot population is expected to grow at a modest rate of 0.3 percent annually to 2004. Reflecting the increased sophistication of both aircraft and their pilots, more pilots were instrument rated in 1992 than ever before (43.8 percent).

DEFINITION OF SERVICE AREA

The initial step in determining aviation demand is to define the geographic area served by the airport. The airport service area is determined primarily by evaluating the location of competing airports, their capabilities and services, and their relative attractiveness and convenience. It should be recognized that aviation demand does not necessarily conform to political or geographic boundaries.

The airport *service area* is an area where there is a potential market for airport services. Access to general aviation airports, commercial service and transportation networks enter into the equation that determines the size of a service area, as well as the quality of aviation facilities, distance and other subjective criteria.

In determining the aviation demand for an airport it is necessary to identify the role of that airport. The primary role of H.A. Clark Memorial Field has been to serve the general aviation needs in the Williams area, which includes the communities of Williams, Ash Fork and Parks. The service area does not extend past Ash Fork to the west, because it was assumed that residents west of Ash Fork would utilize Seligman Airport. It is important to note, however, that some residents west of Ash Fork may chose to use H.A. Clark Memorial field rather than Seligman Airport since Seligman's runway is currently not paved. The service area has not been extended beyond Parks, since residents east of Parks would have reasonable access to Flagstaff Pulliam Airport, a larger facility with a number of aviation services.

As in any business venture, the more attractive the facility in services and capabilities, the more competitive it will be in the market. If the airport's attractiveness increases in relation to nearby airports, so will the size of the service area. If facilities are adequate and rates and fees are competitive at H.A. Clark Memorial Field, some level of general aviation traffic might be attracted to the airport from surrounding areas.

POPULATION PROJECTIONS

Many aviation factors such as based aircraft, aviation demand, passengers, etc., are influenced by population statistics. For this reason, the historical demographics of the Williams area and Coconino County will be examined for use in forecasting aviation factors for H.A. Clark Memorial Field.

A review of the population estimates for the Williams incorporated area and Coconino County in 1980 and 1990 provides the percent change over that period, as

reported by the Arizona Department of Economic Security Population Statistics Unit. The change in population for the City of Williams over this ten year period was 11.74 percent; for Coconino County the change was 28.77 percent.

Population estimates are also available for the communities of Ash Fork and Parks for the year 1990, the most recent census. To establish the population of the H.A. Clark Memorial Field service area, the 1990 population estimates for Williams, Ash Fork and Parks were combined, for a total of 3,685.

Projections from the Arizona Department of Economic Security forecast a population of 3,979 people in the City of Williams by the end of the 20-year planning period, or 2015. This represents an average annual growth rate of 1.82 percent. For the airport service area, a population of 6,679 is anticipated by that same year, representing an average annual growth rate of 2.41 percent. For Coconino County, projections indicate a population of 152,235 by the end of the planning period, representing an average annual growth rate of 1.84 percent. **Table 2A** presents the population forecasts for the City of Williams, the Airport service area and Coconino County.

TABLE 2A
Population Projections

Year	City of Williams	Airport Service Area	Coconino County
1990	2,532	3,685	96,591
FORECAST			
1995	2,839	4,253	108,381
2000	3,133	4,868	119,695
2005	3,421	5,478	130,783
2010	3,696	6,070	141,353
2015	3,979	6,679	152,235
Annual Average Growth Rate	1.82%	2.41%	1.84%

SOURCE: Arizona Department of Economic Security

GENERAL AVIATION DEMAND

General aviation is defined as that portion of civil aviation which encompasses all facets of aviation except commercial and military operations. To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of this activity must be forecast. These indicators of general aviation demand include the following.

- Based Aircraft
- Based Aircraft Fleet Mix
- Aircraft Operations
- Peaking Characteristics

The number of based aircraft is the most basic indicator of general aviation demand.

By first developing a forecast of based aircraft, the growth of the other indicators can be projected. The rationale behind the general aviation activity forecast is presented as follows.

PROJECTED BASED AIRCRAFT

To assess its value in the development of based aircraft forecasts, available historical data on registered/based aircraft for the State of Arizona, Coconino County, and H.A. Clark Memorial Field were gathered and evaluated. While a fairly complete record of historical based aircraft is available for the State as a whole and for Coconino County, historical data for H.A. Clark Memorial Field are incomplete, and appear to be incorrect for some of the years available. The historical based aircraft data for the airport were obtained primarily from a limited number of FAA 5010 Forms and the FAA's National Plan of Integrated Airport Systems which in the case of H.A. Clark Memorial Field are not consistent with each other. Unfortunately, due to this incomplete and unreliable record, the use of these data to establish historical trends would not prove to be meaningful.

It is interesting to note, however, that from 1980 to the present, the number of registered/based aircraft within the State of Arizona and Coconino County has generally been declining. Based on local knowledge, the number of based aircraft at H.A. Clark Memorial Field has also declined over that same period.

Trendline and Linear Regression Analysis

The trendline and linear regression analysis methodologies were reviewed for projecting future based aircraft at H.A. Clark Memorial Field. Due to the limited amount of actual historical data for the airport and the small number of existing based aircraft, this technique did not result in a credible representation of future based aircraft and necessitated the use of different forecasting techniques.

Market Share Analysis

Market share analysis was one of the methods used to project the number of based aircraft at H.A. Clark Memorial Field. The market share method considers the existing and historical percentage of airport-based aircraft to the total registered aircraft in some larger market.

For the H.A. Clark Memorial Field forecasting effort, the number of based aircraft at the airport was compared to the total number of aircraft registered within Coconino, Apache and Navajo Counties. (While it would be more common to base a market share analysis on one county, in this case, the only future forecasts of registered aircraft for Coconino County were combined with Apache and Navajo Counties.)

Due to the incompleteness and inaccuracy of historical based aircraft at the airport, establishing H.A. Clark's share of the Coconino, Apache and Navajo market was based on data for the year 1993. Averaging the ratio from 1991 through 1993 for H.A. Clark Memorial Field yields a ratio of 3.2 percent of this larger market.

The second step in this forecasting method is to apply the established market share to projections of registered aircraft in the larger market area. The most currently prepared forecasts of registered aircraft for Arizona counties was completed in 1988 as part of the Arizona State Aviation System Plan (SASP). **Table 2B** outlines the

forecasting results from this SASP study. For comparison purposes, **Table 2B** also provides historical registered aircraft data for that same tri-county area.

TABLE 2B
Historical Forecast Registered Aircraft Coconino, Apache and Navajo Counties

Year	Total
Historical	
1973	255
1974	219
1975	251
1976	265
1977	306
1978	370
1979	388
1980	402
1981	397
1982	398
1983	419
1984	421
1985	438
1986	367
1987	363
1988	N/A
1989	N/A
1990	N/A
1991	257[2]
1992	250[2]
1993	232[2]
1988 SASP Forecast[1]	
1995	478
2000	537
2005	596
2010	656
2015	722[3]

NOTE: N/A - Not Available
SOURCES: [1] 1988 Arizona State Aviation System Plan (SASP)
[2] ADOT, Aeronautics Division
[3] Value extrapolated by Coffman Associates, Inc.

From 1973 to 1985, the number of registered aircraft within this tri-county area demonstrated an average annual growth rate of 4.6 percent. In consideration of this historical growth, forecasts prepared as part of the 1988 study predicted a somewhat optimistic growth rate for this tri-county area, projecting 478 registered aircraft by 1995. Since 1985, however, the total number of registered aircraft within this area has been in decline. In consideration of the current total of 232 aircraft, the SASP forecast of 478 for 1995 would represent a doubling of aircraft in a two-year period and would be considered highly unlikely. For this reason, forecasts prepared based on these SASP projections of registered aircraft must be viewed cautiously. **Table 2C** provides the results of this market share forecast.

Based Aircraft Per Population Ratio Analysis

Another forecasting technique was the use of a ratio of based aircraft to population. In this technique, the ratio of based aircraft per 1,000 population is applied to population forecasts for the City of Williams and the H.A. Clark Memorial Field service area.

The number of based aircraft per 1,000 population for the City of Williams has averaged 3.18 for the last four years (1990-1993). Applying this ratio to population forecasts for the City, projects nine (9) aircraft based at the airport by the year 1995, and an increase over the planning period to 13 by 2015, as presented in **Table 2C.**

A ratio of population forecast was also completed based on population of the airport's service area. The ratio of based aircraft at H.A. Clark Memorial Field to the population of the airport's service area was determined to be 2.44, based on the year 1990. The most recent population estimates available for the airport service area (Williams, Parks and Ash Fork) are for the year 1990. The resulting population

ratio forecast, presented in **Table 2C**, ranged from ten (10) aircraft by 1995 to 16 by the year 2015.

Other Forecasts

Forecasts available for H.A. Clark Memorial Field through other planning sources include the FAA's National Plan of Integrated Airport Systems (NPIAS), 1990-1999, and the 1988 SASP prepared by ADOT. In addition, forecasts for the airport were developed as part of the previous Airport Master Plan, completed in 1981. The results of each of these studies are reported in **Table 2C.**

TABLE 2C
Forecast of Based Aircraft
H.A. Clark Memorial Field

	1995	2000	2005	2010	2015
Market Share of					
Coconino, Apache & Navajo Counties' Registered Aircraft	15	17	19	21	23
Based Aircraft per 1,000 Population					
City of Williams	9	10	11	12	13
Service Area	10	12	13	15	16
Other Studies					
1988 Arizona SASP	15	17	19	22	25
1990-1999 FAA NPIAS	27	35	N/A	N/A	N/A
1981 Master Plan	28	31	N/A	N/A	N/A
Preferred Forecast	**12**	**14**	**16**	**18**	**20**

Preferred Based Aircraft Forecast

In selecting a preferred forecast for based aircraft, the following considerations were made. Both the FAA NPIAS and previous Airport Master Plan forecasts were considered unrealistic in light of the existing number of based aircraft at the airport and were eliminated from further consideration. The 1988 Arizona SASP forecast and the forecast based on a market share of Coconino, Apache and Navajo Counties, projected growth rates that were considered a little too optimistic in light of recent trends in general aviation activity. The ratio of based aircraft to the population of the City of Williams and the airport service area, the remaining two forecasts, were both considered to be realistic. Due to the increasing tourist activity of the area, enhanced by the growth of Grand Canyon Railroad, the preferred forecast of based aircraft was expected to fall between the based aircraft per 1,000 population within the airport service area and the market share forecast. This middle ground forecast would result in 12 based aircraft in 1995, increasing to 20 by the end of the planning period (**Table 2C, Exhibit 2B**).

BASED AIRCRAFT FLEET MIX

The type of aircraft expected to use the airport must be projected in order to properly size airport facilities. The existing based aircraft fleet mix at H.A. Clark Memorial Field consists entirely of single engine piston aircraft. The overall trend in general aviation is toward a slightly higher percentage of larger, more sophisticated aircraft. A similar trend is expected to occur at H.A. Clark Memorial Field over the planning period. Table 2D provides the mix of existing based aircraft (1994) and the mix of based aircraft forecast for the planning period.

TABLE 2D
Based Aircraft Fleet Mix
H.A. Clark Memorial Field

Year	Single Engine	Multi Engine	Turbo Prop	Jet	Rotor	Total
1994	8	0	0	0	0	8
FORECAST						
1995	12	0	0	0	0	12
2000	13	1	0	0	0	14
2005	15	1	0	0	0	16
2010	16	1	1	0	0	18
2015	16	2	1	0	1	20

AIRCRAFT OPERATIONS

An airport operation is defined as any takeoff or landing performed by an aircraft. There are two types of operations at an airport: local and itinerant. A *local* operation is a takeoff or landing performed by an aircraft that operates in the local traffic pattern within sight of the airport, including the execution of simulated approaches and touch-and-go operations. Local operations are typically associated with training operations. Itinerant operations are those operations performed by an aircraft with a specific origin or destination away from the airport.

Without an Air Traffic Control Tower at the airport to monitor aircraft operations, operational levels can only be estimated. The historical aircraft operational data for the airport were obtained primarily from a limited number of FAA 5010 Forms. As with based aircraft data for H.A. Clark Memorial Field, the record of estimated historical aircraft operations is incomplete and appears to be incorrect for some of the years available; the use of these data to establish historical trends would not prove to be meaningful.

Trendline and Linear Regression Analysis

The trendline and linear regression analysis methodologies were reviewed for use in projecting future aircraft operations at H.A. Clark Memorial Field. Because the operational data available is limited to estimates only and because of the limited number of years for which operational data is available, this forecasting technique did not result in a credible representation of

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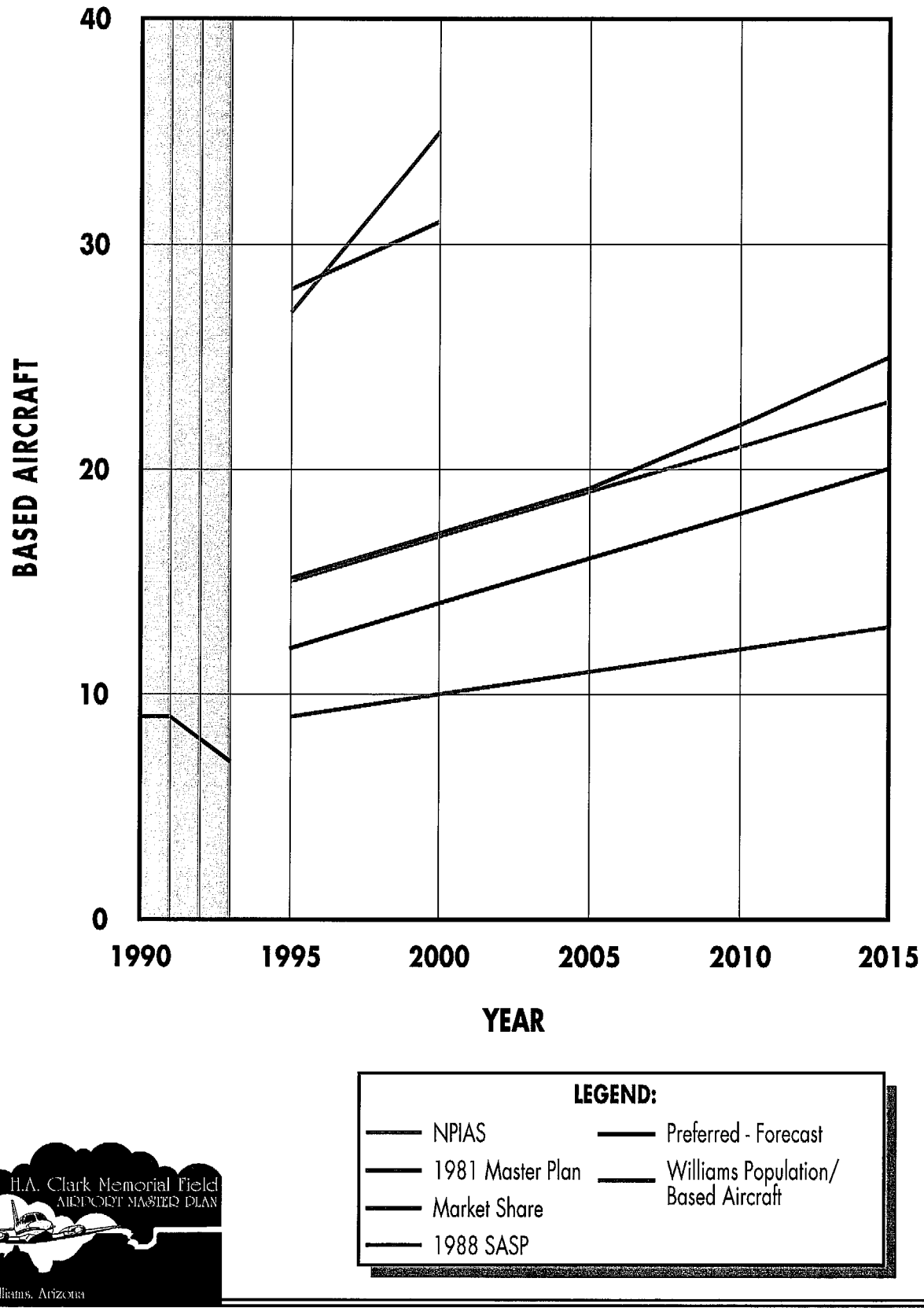

Exhibit 2B
BASED AIRCRAFT FORECAST

future based aircraft and necessitated the use of other forecasting techniques.

Operations per Based Aircraft

Traditionally, the number of general aviation operations has closely correlated the number of based aircraft at an airport. In other words, the more aircraft based at an airport, the more aircraft operations logged. Based on information from other general aviation airports, an airport the size of H.A. Clark Memorial Field can expect to generate from 200 to 500 annual operations for every based aircraft. **Table 2E** illustrates the operations per based aircraft forecast using a high (500) and low (200) value for annual operations per based aircraft. In general, the higher the percentage of training operations conducted at the airport, the higher the operations per based aircraft.

TABLE 2E
General Aviation Operations Forecast
H.A. Clark Memorial Field

	Existing	1995	2000	2005	2010	2015
Ops per Based Aircraft (200)	N/A	2,400	2,800	3,200	3,600	4,000
Ops per Based Aircraft (500)	N/A	6,000	7,000	8,000	9,000	10,000
Preferred Forecast	**2,400[1]**	**3,600**	**4,200**	**4,800**	**5,400**	**6,000**

NOTE: [1] Estimated based on 300 operations per based aircraft.

In order to approximate the level of aircraft training conducted at H.A. Clark Memorial Field, Embry Riddle Aeronautical University (ERAU) in Prescott was contacted. According to ERAU representatives, their students conduct approximately 25 operations per week at the airport all months of the year except for December, January and February. Figuring the use of the airport approximately 40 weeks out of the year at 25 operations per week totals 1,000 operations. This level of activity represents a notable percentage of the total operations anticipated.

According to ERAU, there is an existing and growing need for the university to do more of their flight training at local outlying airports, including H.A. Clark Memorial Field, due to the number of operations occurring at Ernest A. Love Field in Prescott. ERAU indicated that they would use the airport more if fueling facilities were available.

Preferred Forecast

In consideration of the level of operations conducted by ERAU students alone, the 200 operations per based aircraft would appear to be somewhat low for H.A. Clark Memorial Field. On the other hand, 500 operations per based aircraft generally indicates a higher percentage of training activity like that which would occur if a training school was based at the airport. For these reasons, a third value of 300 operations per based aircraft was used to project future operational levels and was selected as the preferred forecast (**Table 2E, Exhibit 2C**).

Local Versus Itinerant Operations

Because no definitive data exist regarding the split of itinerant to local airport operations at H.A. Clark Memorial Field, the percentage of each had to be estimated. Currently, 90 percent of the airport's operations are expected to be itinerant and only ten percent expected to be local, as is typical for airports of this size with similar use characteristics. Over the planning period, as airport operations grow and the use of the airport for flight training increases, the percent of itinerant operations is expected to decrease while local operations increase, resulting in a split of approximately 70 percent itinerant and 30 percent local. Table 2F provides the number of projected local versus itinerant operations for H.A. Clark Memorial Field based on the anticipated change in operational split.

TABLE 2F
General Aviation Operations Forecast - Local Versus Itinerant
H.A. Clark Memorial Field

	1995	2000	2005	2010	2015
Local	360	630	960	1,350	1,800
Itinerant	3,240	3,570	3,840	4,050	4,200
Total	**3,600**	**4,200**	**4,800**	**5,400**	**6,000**

COMMERCIAL SERVICE SPECIALTY USE FORECAST

While H.A. Clark Memorial Field is currently used only for general aviation activity, plans have been formulated by Biegert Aviation, Inc. to initiate scheduled service to the City of Williams as part of a larger Grand Canyon Railroad tour package. The operating name of the airline will be Classic Air. The following information and estimates were provided by Biegert Aviation to project the total passengers and commercial service operations anticipated if this specialty use is implemented.

The intent of Biegert Aviation, Inc. is to provide a tour package to tourists in other cities within the region, (such as Scottsdale, Phoenix, Tucson and Laughlin, Arizona, and Las Vegas, Nevada), which would transport them by air to H.A. Clark Memorial Field and then by railroad to Grand Canyon National Park.

As planned for the initial years of operation, passengers would arrive at the airport in the morning and would be immediately transported to the train depot for departure to Grand Canyon National Park. In the meantime, the tour aircraft would likely be fueled and if necessary serviced at the airport, before being flown to Grand Canyon National Park Airport. A maintenance facility would be built at H.A. Clark Memorial Field to service their aircraft. After spending several hours at the park, tourists would be boarded at the Grand Canyon Airport for their return flight. The entire round trip would be less than one day, with tourists returned to their origination point late in the afternoon.

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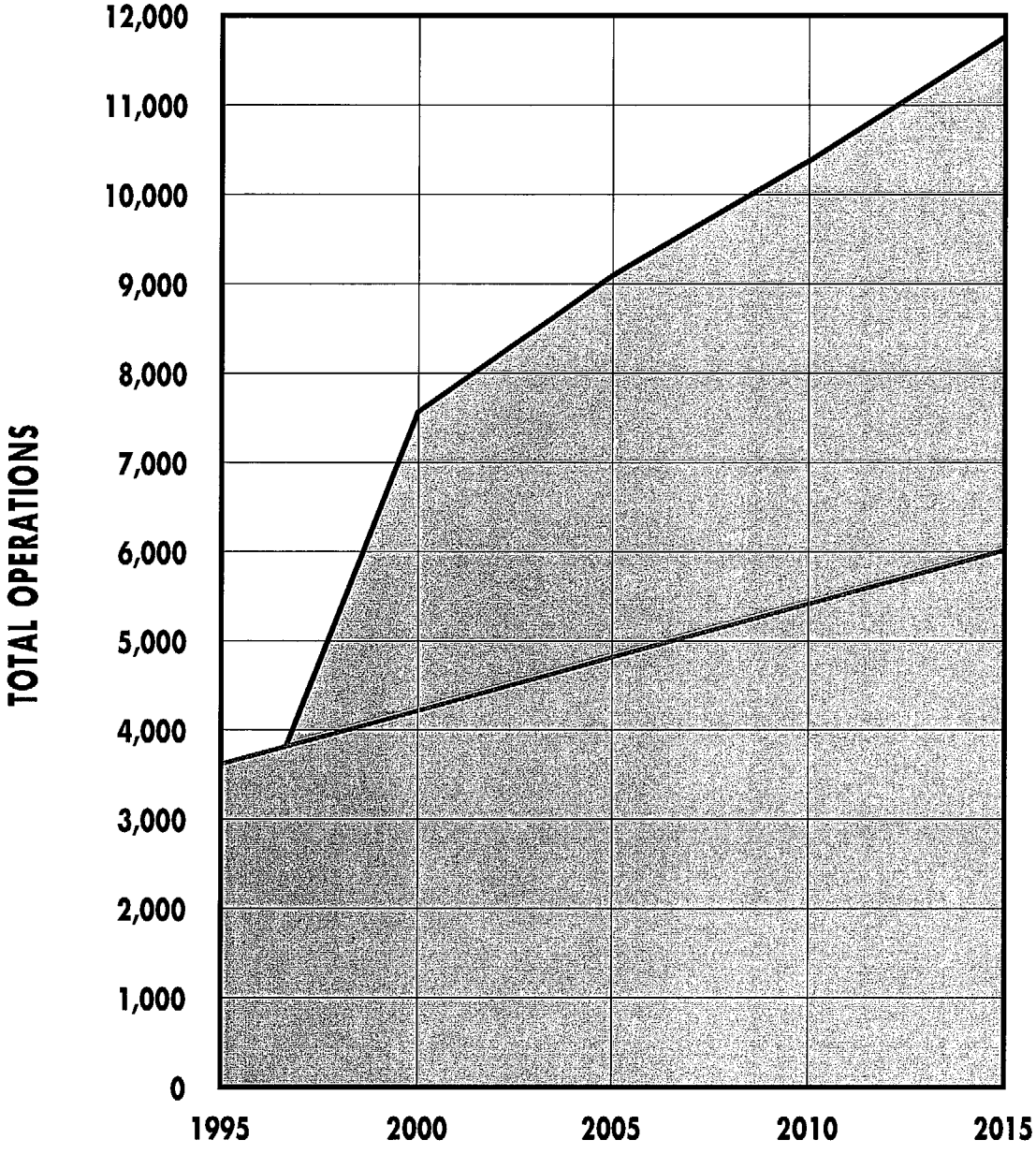

H.A. Clark Memorial Field
AIRPORT MASTER PLAN
Williams, Arizona

Exhibit 2C
TOTAL AIRCRAFT OPERATIONS

Biegert Aviation, Inc. proposes to use Douglas DC-4 aircraft, with the seating configured for 60 passengers. Estimates of the number of flights per day and the number of days per week were provided by Biegert Aviation, Inc. None of these operations were anticipated for 1995, since they do not expect to begin operations at the airport until 1996. By 2000, however, Biegert Aviation estimates that they would conduct a total of 3,352 annual operations at H.A. Clark Memorial Field. By the year 2000 during peak periods, operations would total 14 per day, seven days a week. This level of activity would occur for the months of April, May, June, July, August and September. For the months of February, March, October and November, fewer flights would be scheduled, or roughly 12 operations per day, three to four days per week. During December, flights would be expected to be much more limited or roughly six (6) per day, two days a week. Flight operations would be shut down for the entire month of January.

Because of the nature of these scheduled tour packages, it was assumed that each aircraft would be loaded at its full passenger capacity, or 60 passengers. Multiplying the number of passengers per flight by the total number of annual aircraft arrivals (one-half of total operations), yields 100,560 passengers deplaning (departing) aircraft annually at H.A. Clark Memorial Field by the year 2000, ranging from zero passengers in January to as many as 420 per day in the peak months. The overall average number of passengers per day for the year 2000 would be 276.

While it is very difficult to estimate the level of activity over the remainder of the planning period, from 2000 to 2015, Biegert Aviation expects to maintain a growth rate of approximately five percent per year from the years 2000 to 2005, decreasing to a three percent per year growth rate over the final ten years of the planning period as the market becomes more saturated. Table 2G summarizes the commercial service specialty use forecast for H.A. Clark Memorial Field over the planning period.

TABLE 2G
Commercial Service Specialty Use Forecast
H.A. Clark Memorial Field

	Year				
Activity Indicator	1995	2000	2005	2010	2015
Annual Arrivals	0	1,676	2,139	2,480	2,875
Annual Operations	0	3,352	4,278	4,960	5,750
Total Deplaning Passengers	0	100,560	128,340	148,800	172,500

Exhibit 2C, illustrates the total operations forecast for both general aviation activity and commercial service specialty use over the 20-year planning period.

PEAKING CHARACTERISTICS

Many airport facility needs are affected by the levels of activity during peak periods. In the consideration of peaking

characteristics, the following indicators are quantified.

- **Peak Month** - The Peak Month represents the level of activity that would occur within the busiest month of the year.

- **Design Day** - The Design Day is defined as the average day in the Peak Month. For general aviation activity, this indicator is easily derived by dividing the Peak Month operations by the number of days in the month.

- **Busy Day** - The Busy Day is defined as the busiest day of a typical week in the Peak Month. This indicator is used primarily to determine ramp space requirements.

- **Design Hour** - The Design Hour is considered the peak hour within the Design Day. This indicator is used particularly in airfield demand/capacity analysis, as well as in determining terminal building and access road requirements.

It is important to note that only the Peak Month is an absolute peak within a given year. All the others will be exceeded at various times during the year. These values represent reasonable planning standards that can be applied to airport plans to help identify the appropriate size and capability of the facility.

GENERAL AVIATION PEAKING CHARACTERISTICS

Design Hour Operations

Because no monthly records of aircraft activity exist for H.A. Clark Memorial Field, the actual level of activity that occurs within the Peak Month is not known. For planning purposes, a Peak Month average of 12.0 percent of annual activity was assumed to be applicable to H.A. Clark Memorial Field. This percentage is expected to remain relatively constant throughout the planning period.

The Design Day, also called the average day of the Peak Month, will vary from year to year depending on the number of operations during the Peak Month. Dividing the value of the Peak Month by 31 days per month yields the Design Day.

Typically, the Busy Day operations for a general aviation airport will run ten (10) to 20 percent greater than an average day. Consistent with activity characteristics for general aviation airports, the busy day operations factor has been assumed to be 15 percent more than the average day, or 115 percent of Design Day activity. This peaking factor has been projected to remain constant throughout the planning period.

Design Hour operations are used to establish the peak hourly demand affecting airfield and terminal facilities. Design Hour operations at general aviation airports generally range between 10 and 15 percent of the average day depending on the total activity. The Design Hour activity at H.A. Clark Memorial Field has been projected to remain constant at 12.5 percent throughout the planning period.

The peaking characteristics, which were applied to the forecast annual general aviation operations to obtain future peak operations at H.A. Clark Memorial Field, are presented in **Table 2H**.

Design Hour Pilots and Passengers

The definition of general aviation passenger refers to the average number of pilots and passengers expected to utilize the airport's terminal facilities during a given time. To calculate the Design Hour Pilots and Passengers, an average of 2.0 passengers per operation was applied, beginning with 1.5 passengers per operation in the year 1995 and increasing to 2.5 by the end of the planning period. A summary of the general aviation peaking characteristics for the planning period is presented in **Table 2H.**

TABLE 2H
General Aviation Peaking Characteristics
H.A. Clark Memorial Field

	1995	2000	2005	2010	2015
Annual General Aviation Operations	3,600	4,200	4,800	5,400	6,000
Peak Month	432	504	576	648	720
Design Day	14	16	19	21	23
Busy Day	16	18	22	24	25
Design Hour	1.8	2.0	2.4	2.6	2.9
Design Hour Pilots and Passengers	3	4	5	6	7

COMMERCIAL SERVICE SPECIAL USE PEAKING CHARACTERISTICS

Commercial Service Design Hour Operations

Based on the information provided by Biegert Aviation, Inc., commercial service peaking characteristics were developed for H.A. Clark Memorial Field. The results of this commercial service peaking analysis are presented in **Table 2I.** Also provided in this table are total peaking characteristics, summing both general aviation operations and those associated with this planned commercial service special use.

The Peak Month for commercial service activities in the year 2000 was based on an estimate of 14 operations per day during the peak month multiplied by 31 days per month, or a total of 434 operations. In this case, the Peak Month operations represent roughly 13 percent of the total annual operations, which is fairly consistent with planning standards. Because a significant portion of the anticipated growth in operations would be scheduled during the shoulder or off-season (when activity is less saturated), rather than the peak season, it is anticipated that the Peak Month's percent of total annual operations would reduce slightly over the planning period, to roughly 12 percent.

For the year 2000, based on the Biegert Aviation's estimate of seven flights arriving and seven departing each day during the six months of the peak season, the Design Day, or the average day of the Peak Month, would be 14 operations for the year 2000. Dividing the Peak Month value by 31 for

each of the remaining years of the planning period yields 22 Design Day operations by the year 2015.

Typically, Busy Day operations generally run ten (10) to 20 percent greater than an average day. The Busy Day operations factor has been assumed to be 15 percent more than the average day, or 115 percent of Design Day activity. This peaking factor has been projected to remain constant throughout the planning period.

Design Hour operations are used to establish the peak hourly demand affecting airfield and terminal facilities. With the Biegert Aviation's plan in the year 2000, all seven commercial service arrivals would land at the airport between the hours of 8:00 and 9:30 a.m. so that the passengers can be transported to the railroad depot prior to its standard departure time(s).

Adjusting the seven arrivals that occur in a one and one-half hour period to reflect the number of operations that would occur in a one-hour period yielded five commercial service operations during the Design Hour. This level represents 36 percent of the Design Day. This percentage was anticipated to remain constant over the planning period.

Commercial Service Design Hour Passengers

To estimate Design Hour Passengers, the Design Hour value is multiplied by 60 passengers per aircraft for each year in the planning period. A summary of the commercial service peaking characteristics and the total operations for both general aviation and commercial service activity are presented in **Table 21.**

TABLE 21
Commercial Service & Total Peaking Characteristics
H.A. Clark Memorial Field

	1995	2000	2005	2010	2015
Commercial Service Special Use					
Annual Commercial Service Operations	0	3,352	4,278	4,960	5,750
Peak Month	0	434	539	610	690
Design Day	0	14	17	20	22
Busy Day	0	16	20	23	25
Design Hour	0	5	6	7	8
Design Hour Passengers	0	300	360	420	480
Total Peaking Characteristics (General Aviation and Commercial Service)					
Total Annual Operations	3,600	7,552	9,078	10,360	11,750
Peak Month	432	938	1,115	1,258	1,410
Design Day	14	30	36	41	45
Busy Day	16	34	42	47	50
Design Hour	1.8	7.0	8.4	9.6	10.9

ANNUAL INSTRUMENT APPROACHES

Forecasts of annual instrument approaches (AIA) provide guidance in determining an airport's requirements for navigation aids. An instrument approach as defined by the FAA is "an approach to an airport with intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude."

Examination of weather records obtained for the Flagstaff-Williams area reveals that actual IFR weather conditions occur 4.5 percent of the year. By using the forecast operations for the planning period and a factor of 4.5 percent of the total itinerant approaches, the number of AIA's can be projected for H.A. Clark Memorial Field **(Table 2J).**

Since the FAA's definition of an instrument approach excludes those instrument approaches that do not occur during IFR conditions, actual instrument approaches can be higher, particularly at airports with a high percentage of training activity. With the low forecast of IFR activity, any requirement for additional navigational aids and/or instrument approach procedures would be based on factors other than weather, such as training capacity and overall safety.

TABLE 2J
Annual Instrument Approach Forecast
H.A. Clark Memorial Field

	1995	2000	2005	2010	2015
Itinerant Approaches	1,620	3,461	4,059	4,505	4,975
Total Annual Instrument Approaches	73	156	183	203	224

SUMMARY

This chapter has provided forecasts for those indicators of aviation demand that are essential to the effective analysis of future facility requirements at H.A. Clark Memorial Field. The next step in the master planning process is to assess the capacity of the existing facilities and to determine the size and quantities of various aviation facilities needed to keep pace with demand. For easy reference, Table 2K summarizes the results of previously reported forecasting results.

TABLE 2K
Aviation Forecast Summary
H.A. Clark Memorial Field

	1995	2000	2005	2010	2015
Based Aircraft					
Single Engine	12	13	15	16	16
Multi Engine	0	1	1	1	2
Turboprop	0	0	0	1	1
Rotorcraft	0	0	0	0	1
Total	**12**	**14**	**16**	**18**	**20**
Annual General Aviation Operations					
Local	360	630	960	1,350	1,800
Itinerant	3,240	3,570	3,840	4,050	4,200
Total	**3,600**	**4,200**	**4,800**	**5,400**	**6,000**
Commercial Service Special Use Activity					
Annual Commercial Service Operations	**0**	**3,352**	**4,278**	**4,960**	**5,750**
Total Deplaning Passengers	0	100,560	128,340	148,800	172,500
Total Annual Operations (General Aviation & Commercial Service)					
Total Annual Operations	**3,600**	**7,552**	**9,078**	**10,360**	**11,750**
Annual Instrument Approaches	73	156	183	203	224